REMARKS

Reconsideration and allowance of the above-referenced application are respectfully requested. Claims 1-19 and 36-102 are pending with claims 1, 36, 54, 61, 78, 85, 91, 93, 95, 97, 99, and 101 being independent.

Rejections under 35 U.S.C. § 103(a)

Claims 1-19 and 36-102 are rejected under 35 U.S.C. section 103(a) as allegedly being unpatentable in view of a combination of two or more of Viterbi et al. (US 5,933,462; hereafter "Viterbi"), Thomson Leighton (F. Thomson Leighton, Introduction to Parallel Algorithms and Architectures: Arrays-Trees-Hypercubes, Morgan Kaufmann Publishers, Inc., 1992, pages 1-3, 36-45, 238 and 239; hereafter "Leighton"), and Benedetto et al. (S. Benedetto, D. Divsalar, G. Montorsi, and F. Pollara, Soft-Output Decoding Algorithms in Iterative Decoding of Turbo Codes, TDA progress Report 42-1 24, Feb. 15, 1996). These rejections are traversed.

As an initial matter, a prima facie case of obviousness has not been met because one of ordinary skill in the art would not have been motivated to combine the references and there would not have been a reasonable expectation of success.

Further, the claims are patentable over the cited references for at least the reason that the alleged combination of the references to form the claimed subject matter would not have been obvious to one of ordinary skill in the art.
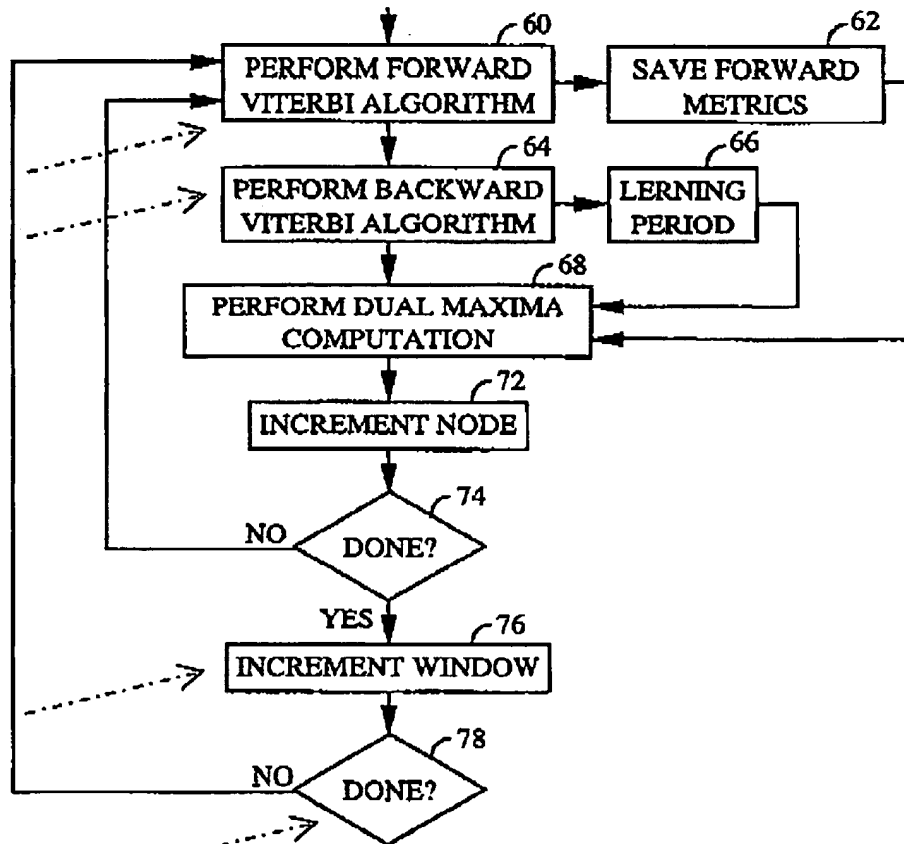
No Motivation to Combine the Cited References and No Expectation of Success

The Office Action contends that one of ordinary skill in the art would have been "highly motivated" to combine the

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alleged teaching in Leighton with alleged teachings in Viterbi
by "recognizing the computations in Viterbi are computationally
intensive and the parallel prefix and suffix computations in
Thomson Leighton provide a parallel algorithm used for
computationally intensive algorithms to speed processing up."
This is not the case.

Viterbi teaches computation of state metrics using serial
prefix and suffix computations. For example, FIG. 7 of Viterbi
is a flowchart that includes performing a forward computation
and a backward computation prior to incrementing a window of
computation, as, at boxes 60-74:

```
            ┌─────────────────────┐  ~60     ┌─────────────────────┐ ~62
     ┌─────▶│  PERFORM FORWARD    │─────────▶│   SAVE FORWARD      │
     │  ┌──▶│  VITERBI ALGORITHM  │          │      METRICS        │
     │  │   └─────────────────────┘          └─────────────────────┘
     │  │             │           ~64                  ~66
     │  │   ┌─────────────────────┐          ┌─────────────────────┐
     │  │ ─▶│ PERFORM BACKWARD    │─────────▶│    LERNING          │
     │  │   │ VITERBI ALGORITHM   │          │    PERIOD           │
     │  │   └─────────────────────┘          └─────────────────────┘
     │  │             │           ~68
     │  │   ┌─────────────────────────┐
     │  │   │ PERFORM DUAL MAXIMA      │◀───
     │  │   │      COMPUTATION         │◀───
     │  │   └─────────────────────────┘
     │  │             │           ~72
     │  │   ┌─────────────────────┐
     │  │   │   INCREMENT NODE     │
     │  │   └─────────────────────┘
     │  │             │           ~74
     │  │      NO    ╱  DONE?  ╲
     │  └──────────◀            ▶
     │              ╲          ╱
     │               YES │         ~76
     │          ┌─────────────────────┐
     │       ─▶ │  INCREMENT WINDOW    │
     │          └─────────────────────┘
     │                  │           ~78
     │          NO    ╱  DONE?  ╲
     └──────────────◀            ▶
                      ╲          ╱
```

See also Viterbi, FIG. 9.

Leighton is a textbook that includes teachings of broad
concepts of parallel prefix computations. pp. 2-3.

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The independent claims include features that are directed to using a tree structure arranged to perform parallel prefix and/or suffix operations to compute forward and/or backward state metrics, respectively. See, e.g., claim 1. These features are not disclosed in the cited references (as admitted in prior Office Actions), and one of ordinary skill in the art would not have been motivated to combine the cited references to form these features.

The alleged broad principles of "parallel prefix computations" would simply not have been recognized as applicable to perform parallel prefix and/or suffix operations to compute state metrics. This is at least for the reason that there is a data dependency in Viterbi that inhibits a parallelization of components to perform relevant computations-- something the Office Action's rationale overlooks. Thus, the Office Action has failed to provide a sufficient motivation to combine.

As discussed above, the Viterbi algorithm relies upon serial processing to compute state metrics. As part of this processing, a decoder forms branch (or path) metrics and passes metrics to a processor that serially moves forward along the trellis and calculates state metrics at every step. A second processor is given the same branch metrics and moves backwards along the trellis, again one step at a time, and serially calculates the backward state metrics along the way. A third processor then receives both forward and backwards state metrics as well as the branch metrics and creates soft outputs. Therefore the latency of the unit is O(N), where N is the length of the trellis being decoded and one section of the trellis is decoded per operation. As part of these computations for state metrics, intermediate last-in-first-out memory elements are necessary to align the data. Consequently, each state metric

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calculation requires that the previous state metrics have been calculated already. Therefore there is a data dependency that prevents parallelization, or the application of similar hardware principles such as pipelining.

The data dependency would negate any broad principles that might influence one of ordinary skill in the art to combine the references. Given that the test of motivation to combine requires that the "combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole" is to be taken into account, a broad principle that is alleged to be implied from one reference should not be sufficient evidence of motivation to combine in view of the above, and, thus one of ordinary skill in the art would not have been motivated to combine the references. See generally, In re Kotzab, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000).

In addition, as the broad principles of parallel computation could not easily be applied to the serial computations of the Viterbi algorithm that were limited by a serial computation having a data dependency, there is no reason to believe that one of ordinary skill in the art would have expected success by the mere combination of the references.

The Claims are Not Obvious

In addition, one of ordinary skill in the art would not have found the claimed subject matter obvious.

In particular, even were the earlier declared broad principle considered sufficient a sufficient motivation to combine the references, the obstacles created by the data dependency of Viterbi, as discussed above, would have motivated one of ordinary skill in the art not to combine the references to form the subject matter of the presently presented claims.

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As there is no motivation to combine the cited references,
there is no expectation of success from a simple combination of
the references, and a combination of the references would not be
obvious, the independent claims are allowable. Claims 2-19, 37-
53, 55-60, 62-77, 79-84, 86-90, 92, 94, 96, 98, 100, and 102
depend, directly or indirectly, from claims 1, 36, 54, 61, 78,
85, 91, 93, 95, 97, 99, and 101. Accordingly, these claims are
allowable for at least the reasons given above.

Conclusion

In view of the above remarks, therefore, all of the claims
should be in condition for allowance. A formal notice to that
effect is respectfully requested.

It is believed that all of the pending claims have been
addressed. However, the absence of a reply to a specific
rejection, issue or comment does not signify agreement with or
concession of that rejection, issue or comment. In addition,
because the arguments made above may not be exhaustive, there
may be reasons for patentability of any or all pending claims
(or other claims) that have not been expressed. Finally,
nothing in this paper should be construed as an intent to
concede any issue with regard to any claim, except as
specifically stated in this paper.

Attorney's Docket No.:06666-077001

Applicant asks that all claims be allowed. Please apply any charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

Date: 4/12/06

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